Blue Folder

Memorandum

DATE: August 26, 1997

TO: TDSF File # 60-534

FROM: Brenda Apple

RE: Monsanto Chemical Company Sites

Site 4 (60-534), Site 3 (60-535), Site 5 (60-536), Site 12 (60-537)

Columbia, Maury County, TN

EPA ID# TND004048104

SUBJECT: TDSF Site Disposition

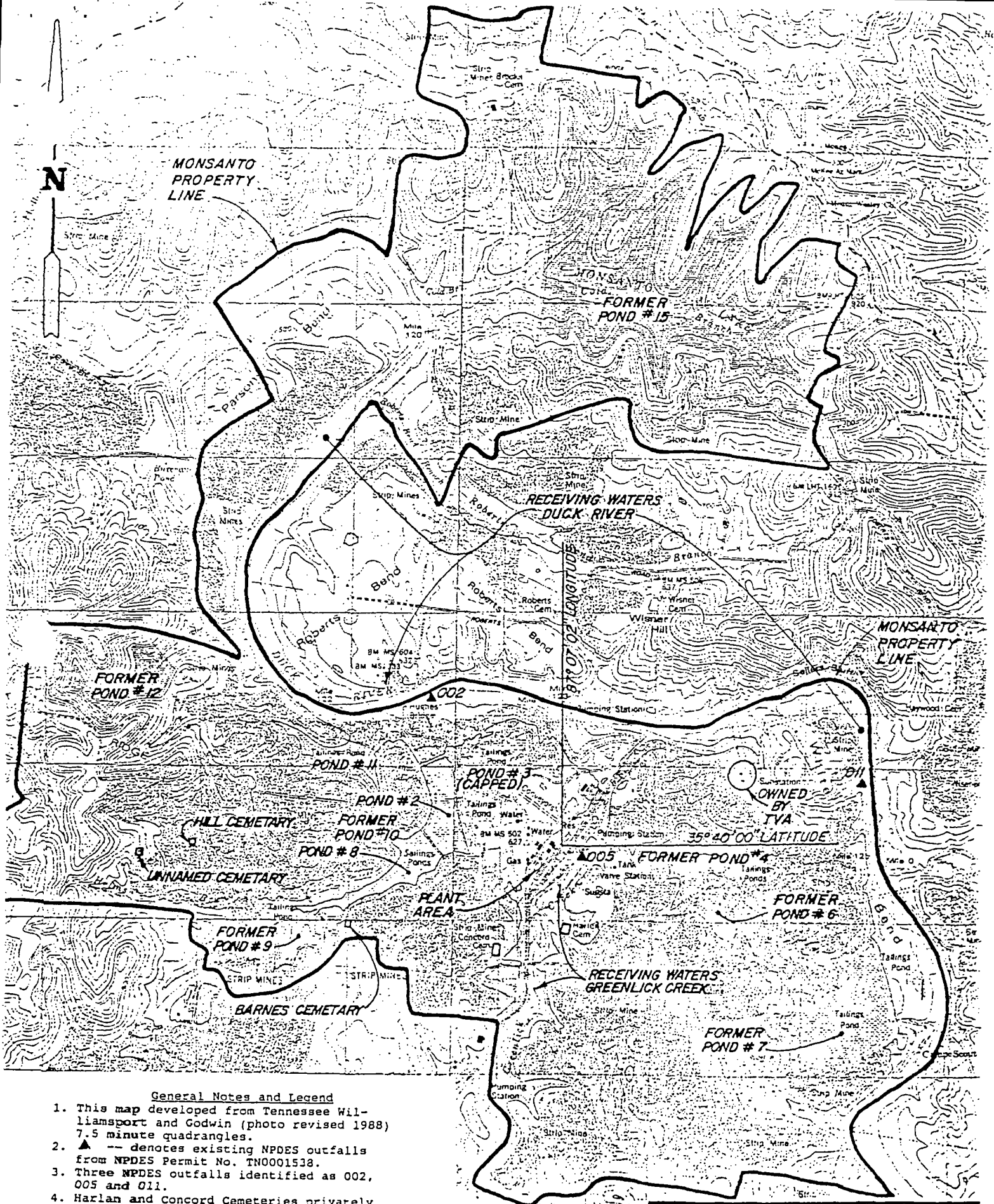
In 1991, three of the sites listed above were closed by capping and groundwater monitoring. The fourth site (Site 12) was partially capped with the Phosphorous drumming operations building and several underground storage tanks remaining. All four sites contained phosphorous contaminated fluids or materials and were closed in place. Groundwater monitoring wells have been installed to monitor each site and other selected areas of the facility such as nearby Greenlick Creek. Leachate from Site 12 is collected and treated in an on-site wastewater treatment system. Drumming operations at Site 12 have ceased in 1997 and the remainder of this site will be capped in 1998 in a manner commensurate with the previous closures.

An after action Record of Decision (ROD) was signed December 31, 1992 and is available for more detail on remediation activities. The site is in the Operation, Maintenance and Monitoring phase of remediation.

Approved: Brenda K. Apple Date: 8/27/97

Brenda K. Apple, Nashville Field Office Manager

10707663

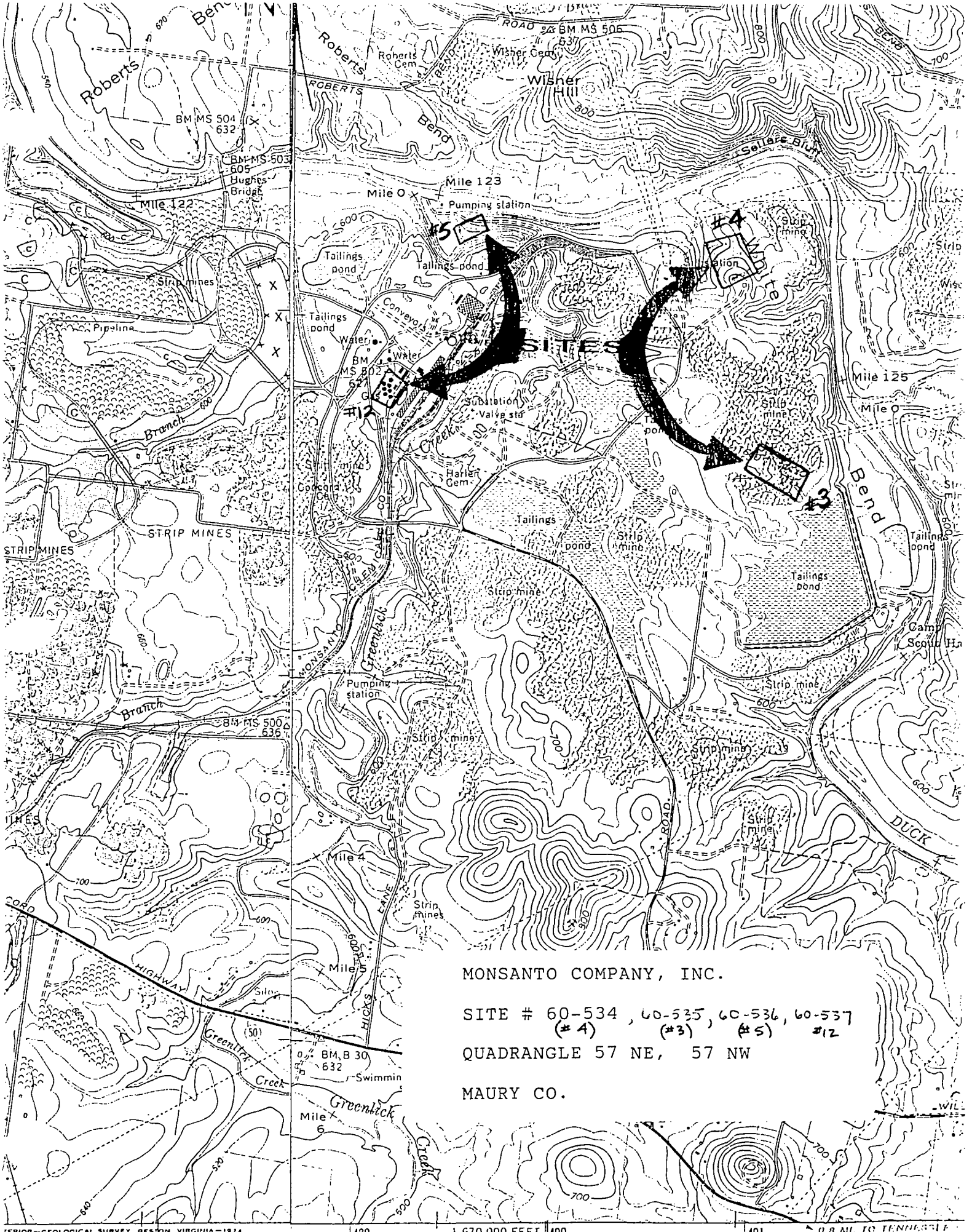


General Notes and Legend

1. This map developed from Tennessee Williamsport and Godwin (photo revised 1988) 7.5 minute quadrangles.
2. ▲ -- denotes existing NPDES outfalls from NPDES Permit No. TN0001538.
3. Three NPDES outfalls identified as 002, 005 and 011.
4. Harlan and Concord Cemeteries privately owned/not Monsanto property.

(Approximately 5300 ACRES) BKA

Location Map
NPDES Outfalls
Monsanto Company Plant
Columbia, Tennessee 4/7/93



MONSANTO COMPANY, INC.

SITE # 60-534 (#4), 60-535 (#3), 60-536 (#5), 60-537 #12

QUADRANGLE 57 NE, 57 NW

MAURY CO.

TERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1974

488000m.E. 87°07'30" 489 1 670 000 FEET 490 491

0.8 MI. TO TENNESSEE
COLUMBIA 3.6 MI.

(TVA 57-NW) Mapped and edited by Tennessee Valley Authority

ROAD CLASSIFICATION

Blue Folder

STATE OF TENNESSEE
DIVISION OF SUPERFUND
RECORD OF DECISION

Remedial Alternative Selection
for
Monsanto Chemical Company
Site ID # 60-534
Site ID # 60-535
Site ID # 60-536
Site ID # 60-537

I. SITE:

Monsanto Chemical Company, Maury County, Tennessee

II. DOCUMENTS REVIEWED:

- Site Investigation, Engineering Science, December 1985
- Hydrologic Monitoring Report, ES, October 1986
- Supplementary Site Investigation-Site 20, ES, September 1986
- Ground-Water Investigation, ES, May 1986
- Supplementary Site Investigation, ES, March 1986
- Remedial Action Plan, March 1986
- Hazard Evaluation/Remedial Alternatives Report, ES, September 1990

III. DESCRIPTION OF THE SELECTED REMEDY:

The selected alternative is protective of human health, safety, and the environment as described in the Hazard Evaluation/Remedial Alternatives Report, September 1990.

The selected remedy for Sites 3, 4 and 5 is Alternative 1, which includes:

1. No action with the exception of long term monitoring of ground and surface water. This alternative is in light of the fact that a clay cap has already been installed on the sites.

2. Specifications on the caps have been forwarded to the Department.

The selected remedy for Site 12 is Alternative 2, which includes:

1. Clay fill used to cover the waste, compacted to achieve a low-permeability (10-7 cm/sec) cover.

2. Place a (4) to six (6) inches of top soil over the site and seed to produce a good permanent grass cover.

3. Long term monitoring of ground and surface water.

4. A retaining wall is already in place down gradient of the site to intercept phosphorus migration in ground water.

5. Seepage from the retaining wall is collected and treated on-site in a wastewater treatment plant designed for this purpose.

The long term operation and maintenance (O&M) activities are projected to include:

1. Inspect and maintain the integrity of the cover on a periodic basis. The schedule will be established in the Final Report.

2. Quarterly ground and surface water monitoring and reporting.

3. Annual reporting to summarize pertinent site activities and/or details.

Declarations:

Consistent with Part 2 of The Hazardous Waste Management Act as amended 1986 (the State Superfund Law), I have determined that the selected remedial actions at the Monsanto sites are cost effective remedies that will provide adequate protection to the public health, welfare and the environment.

12-31-92
Date

Kenneth W. Bunting, Acting Director
Division of Superfund
Tennessee Department of Environment
and Conservation

Record of Decision

Monsanto Chemical Company
Columbia, Maury County, Tennessee
State ID # 60-534 #4
State ID # 60-535 #3
State ID # 60-536 #5
State ID # 60-537 #12

SITE BACKGROUND AND HISTORY

The Monsanto property is located off Highway 50, west of Columbia, Tennessee and encompasses approximately 5300 acres. Monsanto began operating an elemental phosphorus plant at Columbia in 1936. Phosphorus ore was mined and processed at this facility to produce elemental phosphorus. Production activities at the plant were terminated in October 1986 and the plant is currently being dismantled. Some structures will remain after the dismantling process including the office building and an operations building where phosphorus , which is shipped in from Monsanto's Idaho plant, is packaged in drums and prepared for shipment.

While the plant was in operation, waste fluids and materials were stored or disposed of at several locations within the facility boundaries. Twenty-one such sites have been identified and investigated. A preliminary evaluation was conducted in 1985 at each site with respect to site characteristics and potential impact to groundwater. A program for monitoring groundwater was established at eleven of the sites. The program included drilling test borings, installing groundwater monitoring wells, measuring water levels and sampling and analyzing groundwater. As a result of the findings of these initial investigations, four of the sites were placed on the Tennessee Superfund Promulgated List in 1985. The four sites include the Old Phosphorus Disposal Area (Site 3), Phosphorus Slurry Disposal (Site 4), No.1 Pond Disposal Facility (Site 5), and the Old Tank Farm (Site 12)[See Table 1.1 attached]. A detailed description of each site follows:

Site 3 was a phosphorus barrel dump. Drums of phosphorus containing material were reportedly brought here for disposal from 1950 until 1978. The area was closed and capped in 1978 and recapped in 1991 as part of final remediation activities.

Site 4 is a closed phosphorus slurry dump. The site received phosphorus containing material, coke, dust, and slurry from the phosphorus still and centrifuge from the mid-1950's to 1978. The site also includes an area where asbestos containing phosphorus was placed, an area where treated oil waste was placed, and an area where some large equipment containing phosphorus was buried. The site was closed and covered with a clay cap (approximately three feet thick) in 1978 and recapped in 1987.

Site 5 is a closed sanitary and solid waste disposal area. This site, previously referred to as Tailings Pond No. 1, was used for sanitary and solid waste disposal from the 1950's to 1978. The site was closed in 1978. The eastern

portion of the site was covered with a three foot thick clay cap in 1987 and the western portion of the site was capped in 1989.

Site 12 is located in the plant area to the west of the phosphorus storage and shipping area. Twelve gunite (concrete) storage tanks, which were built partially below grade, were used to store phosphorus and phossy water from 1948 to 1955. Materials stored in the tanks leaked to underlying rocks and soil. The tanks were emptied, filled with slag and covered with soil. Elemental phosphorus was recovered downgradient and drummed. A retaining wall was constructed in the early 1980's downgradient of the site to intercept phosphorus migration in the groundwater. Seepage from the retaining wall is collected in sumps and treated in the on-site wastewater treatment plant. The site was capped in 1991 as part of the final remediation activities.

PROBLEM DEFINITION

Contaminants of Concern

The following contaminants in groundwater, soils, and surface water have been analyzed for: Lead, Chromium, Arsenic, Cyanide, Fluoride, Phosphate (PO4 soluble) and Elemental Phosphorus (P4). Only elemental phosphorus has been found at significantly high levels.

Elemental phosphorus is a waxy solid, normally pale yellow to straw colored. It ignites spontaneously on contact with air at temperatures at or above 86 degrees F. The melting point of phosphorus is 110degrees F and the solubility is 3 mg/L (at 54 degrees F).

Groundwater Quality

Monsanto submitted a Hydrologic Monitoring Plan to the State of Tennessee in 1986. In accordance with the plan, Monsanto has conducted quarterly monitoring of groundwater and surface water since 1987. Every quarter, groundwater samples are collected from 38 monitoring wells and the groundwater level is recorded.

The concentrations of lead, chromium, arsenic and fluoride in the groundwater at the 4 sites are less than the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCL's) with the exception of arsenic at Site 4 as described below. Phosphate and Cyanide do not have a MCL but are not considered major contaminants of concern. Elemental phosphorus also does not have a MCL but is considered the major contaminant of concern.

Site 3. Groundwater beneath this site is monitored quarterly utilizing well #3 east. Elemental phosphorus levels have been consistently low and have not been over 0.01 ppb since the fourth quarter of 1987.

Site 4. Groundwater beneath this site is monitored quarterly utilizing wells 4-5, 4-6, 4-7 and 4-8. Arsenic levels in well 4-6 have exceeded the MCL of 0.05 ppm on occasion with a level of 0.088 ppm. Elemental phosphorus levels have been consistently low and have not been over 0.03 ppb since 1987 with the exception of one quarter.

Site 5. Groundwater beneath this site is monitored quarterly utilizing wells 5-15 and 5-16. Elemental phosphorus levels have been fairly low over the three and a half year monitoring period fluctuating between 0.002 ppb and 0.205 ppb.

Site 12. Groundwater beneath Site 12 is monitored quarterly utilizing wells 12-1, 12-2 and, 12-4. Elemental phosphorus levels have fluctuated significantly between 0.003 ppb and 265 ppb in two of the wells (12-1 and 12-4). Most significantly, levels in well 12-4 have demonstrated an increasing trend. Levels have been consistently high in the other well (12-2) ranging between 1.48 ppb and 1,440 ppb with an average of approximately 905 ppb.

Because the shallow groundwater generally flows from the site towards Greenlick Creek, monitoring wells 17-5, 19-1, 19-3, 19-4, 19-5, and 19-7 are sampled quarterly to detect any movement of elemental phosphorus towards Greenlick Creek. The four wells between Site 12 and Greenlick Creek (17-5, 19-1, 19-4 and 19-3) have shown highly fluctuating ranges of phosphorus from 0.001 to 790 ppb with no significant trends up or down. The two wells nearer Greenlick Creek (19-5 and 19-7) have shown less moderate levels of phosphorus ranging between 0.002 to 20.0 ppb.

Three deep wells (well depth greater than 100 feet), namely 12-9, 19-9, and 19-10, were installed and monitored during the HE/RA study to evaluate the potential for phosphorus to migrate deeper into the bedrock. Well 12-9 is located near the highly contaminated shallow well (12-2) and has shown no phosphorus contamination at the detection limit of 0.008 ppb. Wells 19-9 and 19-10 have likewise shown no contamination at the detection limit.

In summary, significant migration of phosphorus in the shallow unconfined aquifer is not occurring at Sites 3, 4 and 5. There does appear to be some migration in the deeper semi-confined aquifer at Site 12. With groundwater flow towards Greenlick Creek, it is important to note that wells between Site 12 and the creek have fluctuated in levels of phosphorus and wells near the creek have shown lesser amounts. The deep wells have not shown evidence of contamination.

Surface Water Quality

As part of the Supplementary Site Investigation performed in 1986, surface water samples were collected from nine locations. These included an on-site pond and spring effluent, one location on Gin Creek, four locations on Greenlick Creek and two locations on the Duck River. According to the Hydrologic Monitoring Plan, surface water samples at seven of these locations have been monitored on a quarterly basis since 1987.

The concentrations of lead, chromium, arsenic and fluoride in surface water have been less than the SDWA MCL's. Point source discharges to Greenlick Creek and the Duck River are presently regulated by NPDES permit through the Tennessee Division of Water Pollution Control. Two outfalls (002 and 011) discharge to the Duck River and two outfalls (005 and 009) discharge to Greenlick Creek. Parameters monitored include: Total Suspended Solids, Total Phosphates, Soluble Fluoride, Elemental Phosphorus, Cyanide, Chlorine and pH. An acceptable discharge level of 5 ppb of elemental phosphorus has been established. All effluent limitations are presently being met.

REMEDIAL ACTION

Objectives

Remedial action objectives include:

* Stabilizing the amount of phosphorus leaching into the groundwater.

* Reducing the migration of phosphorus from the sites.

Options

The following alternatives were developed for the Old Phosphorus Disposal Area (Site 3), the Phosphorus Slurry Disposal (Site 4), and the No. 1 Pond Disposal Facility (Site 5):

Alternative 1 - No action with the exception of long term monitoring of groundwater (Sites 3, 4 and 5) and surface water (Site 5).

Alternative 2 - Excavation of contaminated material, placement of excavated material in the on-site permitted landfill, backfill excavated area with clean soil, cap, regrade, and long term monitoring of ground water (Sites 3, 4 and 5) and surface water (Site 5).

Alternative 3 - Excavation of contaminated material, treatment of excavated material in ERCO still, backfill excavated area with clean fill, cap, regrade, and long term monitoring of ground water (Sites 3, 4 and 5) and surface water (Site 5).

The following alternatives were developed for the Old Tank Farm (Site 12):

Alternative 1 - No action with the exception of long term monitoring of ground water and surface water.

Alternative 2 - Covering the site with either a clay cap or a multi-media cap and long term monitoring of ground water and surface water.

Alternative 3 - Covering the site with either a clay cap or a multi-media cap, extraction of shallow ground water, treatment of extracted ground water, and long term monitoring of ground water and surface water.

Alternative 4 - Excavation of contaminated material, placement of excavated material in the on-site permitted landfill, backfill excavated area with clean fill, cap, regrade, and long term monitoring of ground water and surface water.

Alternative 5 - Excavation of contaminated material, treatment of excavated material in ERCO still, backfill excavated area with clean fill, cap, regrade, and long term monitoring of groundwater and surface water.

Selected Alternatives

Site 3. The alternative for this site was comprised of recapping with long term monitoring of groundwater. Specifications on the cap have been forwarded to the Department. Quarterly groundwater monitoring data indicates no significant increases in phosphorus concentrations since 1987.

Sites 4 and 5. The alternative for these sites was comprised of no action with the exception of long term monitoring of groundwater at site 4 and long term monitoring of groundwater and surface water at site 5. Site 4 was covered with a clay cap in 1978 and recaped in 1987. The eastern portion of Site 5 was covered in 1987 and the western portion of the site was capped in 1989. Specifications on the caps have been forwarded to the Department. Quarterly groundwater and surface water monitoring data indicates no significant increases in phosphorus concentrations since 1987.

Site 12. The alternative for this site was comprised of capping with long term monitoring of groundwater and surface water. A clay cap was utilized on Site 12 in conjunction with asphalt and concrete capping of the adjacent drum handling area. A retaining wall was already in place downgradient of the site to intercept phosphorus migration in groundwater. Seepage from the retaining wall is collected in sumps then treated in the onsite wastewater treatment plant. Specifications for the cap have been forwarded to the Department and the capping activities were completed in 1991.

COMMUNITY RELATIONS

Public Announcements concerning proposed site activities were placed in "The Daily Herald," a local newspaper, for three consecutive issues in December of 1990. No questions or comments were received; therefor, a Public Meeting was not considered necessary and was not held.

OPERATION AND MAINTENANCE

Operation and maintenance requirements will be outlined in the Final Report which will also outline future monitoring requirements. Continued monitoring of groundwater on a periodic basis will allow evaluation of whether or not migration of phosphorus continues. In the event of migration in the future, the feasibility of shallow ground- water recovery using pump and treat systems (or other systems) will have to be examined.

TABLE 1.1[a]
SITE SUMMARY
MONSANTO CHEMICAL COMPANY
COLUMBIA, TENNESSEE

Site No.	Site Name on State of Tennessee's Promulgated List	Site Name at Monsanto	Approximate Years of Operation	Status	Monitoring Program
3	Old Phosphorus Disposal Area	Barrel Dump	1950-1978	Inactive and covered	One shallow well
4	Phosphorus Slurry Disposal	Phosphorus Slurry Dump	1955-1978	Inactive and covered	Four shallow wells
5	No. 1 Pond Disposal Facility	Sanitary/Solid Waste Dump	1950-1978	Inactive and covered	Two shallow wells
12	Old Tank Farm	Phosphorus Tank Farm	1948-1955	Inactive	Nine shallow wells; three deep wells

(a) - Modified Table 1.1, Site Investigation Report (ES 1985).

ENGINEERING-SCIENCE, INC.
57 Executive Park South
Suite 590
Atlanta, Georgia 30329